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graph to the mosses and liverworts (Bryophyta), and another to the ferns and their allies (Pteridophyta); with four pages to the seed-bearing plants (Phanerogamia).—Forestry Bulletin, No. 18, gives the fuel values of fifty-five of the more important woods of the United States. The first five on the list are (1) *Cercocarpus ledifolius*, (2) *Pinus australis*, (3) *Carya alba*, (4) *Quercus prinus*, (5) *Pinus rigida*.—Forestry Bulletins, 19, 20 and 21, contain maps showing the forest areas of California, Oregon and Washington Territory. Of the latter the remark is made that "west of the Cascade mountains it is covered by the heaviest continuous belt of forest growth in the United States." Of this the "red or yellow fir" (*Pseudotsuga douglasii*) known in the East as the Douglas spruce, forms "about seven-eighths of the forest growth."—Henry Trimen in the Dec. number of the *Journal of Botany* announces his withdrawal from that periodical, declining "to risk any further loss." James Britten, the well-known editor, has bravely "determined to carry on the journal" at his own risk "for at least another year," and appeals to its friends for aid in obtaining additional subscribers. Cannot American botanists do somewhat towards aiding Mr. Britten in his laudable attempt to keep alive this old and valuable journal. Subscriptions (twelve shillings) should be sent to the publishers, West, Newman & Co., 54 Hatton Garden, London, E. C., England.—In contrast with the foregoing, it is gratifying to note the steady growth of the *Botanical Gazette*, now entered upon its eighth year, enlarged and greatly improved. It is upon a good footing, financially, and Professor Coulter is to be congratulated upon the assured success of his undertaking. The addition of Professor C. R. Barnes and Mr. J. C. Arthur to the editorial force will doubtless enable the *Gazette* to make still further improvement.—Davis L. James has republished in the Jour. Cinn. Soc. Nat. Hist., the descriptions of new species of Fungi collected in the vicinity of Cincinnati, by Thomas G. Lea, and described by Rev. M. J. Berkeley. The original, published in 1849, has long been so rare as to be practically inaccessible to all but a very few students. Descriptions are given of fifty-three species; of these twenty-three are noted as having been described also in *Hooker's Jour. Bot.*, Vol. iv.—Dr. Goodale, of Harvard University, has recently imported from Germany a large quantity of apparatus for making experiments and investigations in vegetable physiology. A new laboratory for physiological work is to be erected just back of the present row of buildings at the Botanic Gardens.

ENTOMOLOGY.¹

THE FOOD RELATIONS OF THE CARABIDÆ AND COCCINELLIDÆ.—Professor S. A. Forbes, State entomologist of Illinois, has just published a valuable paper entitled, "The food relations of the

¹ This department is edited by Professor C. V. RILEY, Washington, D. C., to whom communications, books for notice, etc., should be sent.

Carabidæ and Coccinellidæ," in Bulletin No. 6, Illinois State Laboratory of Natural History, Jan., 1883. He correctly remarks that "observations of the food of these beetles have hitherto been left almost wholly to chance, and have nowhere been systematically pursued—from which it has resulted that we know their habits only in the most conspicuous situations, and have not a fair idea of the general average of their food."

Such systematic observations based on microscopic examinations of the contents of the alimentary canal, have been pursued by Professor Forbes since 1880, and we have already alluded to some of the results (see AMERICAN NATURALIST for April, 1881, pp. 325-326). This latest contribution contains interesting, suggestive and carefully arranged facts, and we have room only to indicate the chief results.

As to the Coccinellidæ, of which thirty-nine specimens were dissected, representing four genera and seven species, the results show that considering the different conditions under which the specimens were obtained, the food seems to be remarkably simple and uniform. It varies but little in the different genera, and consists almost wholly of spores of lower cryptogams, pollen grains and plant-lice. Treating the thirty-nine specimens as a whole, it was found that their food was thirty-seven per cent. animal (thirty per cent. of which consists of insects) and sixty-three per cent. vegetable (fourteen per cent. of this consisting of pollen of grasses and Compositæ, four per cent. of spores of lichens, and not less than forty-five per cent. of spores of fungi).

Professor Forbes concludes "that the data derived from the thirty-nine specimens here discussed, will be found sufficient for a correct general food of the family under ordinary circumstances." The similarity in structure of the mouth-parts throughout the whole family, seems to be a proof of this generalization.

The food question in the Carabidæ is more complicated. The general table shows that the food of Calosoma, Pasimachus, Scarites and Brachinus (only one specimen examined) is composed wholly of animal matter, while in Harpalus and Anisodactylus¹ the animal matter represents respectively only twelve and twenty-one per cent. These two abundant genera, Professor Forbes remarks, can hardly be classed as carnivorous insects at all, and Amara should probably also be placed in the same category. Other genera are intermediate between the two extremes. "If we now look to the structure of these beetles for some explanation of their differences of habit, we shall find corresponding variations in the form and structure of the mandibles. Where the mandibles are long and curved, and are destitute of basal molar processes, but are provided at or near the middle of the cutting edge with processes relatively long and sharp, the beetle seems to feed substan-

¹ Amphasia, which has the lowest percentage of animal food, viz., seven per cent., is now included in Anisodactylus.

tially upon soft or liquid animal food [*e. g.*, *Calosoma*]. If they are of medium length, somewhat slender, broad at base and tapering distally, with the tip acute, and provided with basal processes which are not especially prominent or sharp, the food is chiefly animal, but solid structures are masticated and swallowed, and some vegetation appears in the alimentary canal [*e. g.*, *Chlænium*]; while finally, if they are short and quadrate, blunt at the tips, and provided either with strong basal processes or broad opposed surfaces, vegetable food is found to predominate" [*e. g.*, *Anisodactylus*].

The nature of the food taken by the *Carabidæ* is also much more varied than in the *Coccinellidæ*, the animal food including mollusks (slugs) and insects of all orders, while the vegetable food is composed of seeds (the graminaceous plants furnishing by far the greatest percentage), pollen and spores of lichens and fungi. Considering the 117 specimens which were dissected we find that, as a whole, their food consisted of fifty-seven per cent. of animal food and forty-three per cent. of vegetable food.

RELATIONS OF THE *CARABIDÆ* AND *COCCINELLIDÆ* TO BIRDS.—Not less interesting than the above generalization are those made by Professor Forbes in the same paper on the relation of these two families to birds. The *Coccinellidæ* were not taken at all by the feathered tribe, and the *Carabidæ* seem to be eaten in proportion as they have phytophagous habits. He gives the following summary:

"It will be seen that there is a very wide difference between the number of *Carabidæ* proper taken by these birds, and the number of *Harpalidæ*, representatives of the former group occurring in only six specimens, and of the latter in 116. On the other hand, fifty-nine of the birds had taken *Harpalids*, which may be fairly classed with the second group established in this paper [those which take a much larger ratio of animal than of vegetable food, but masticate and swallow it], and fifty-seven had taken those belonging to the third group, or phytophagous *Carabidæ*. The genera most preyed upon are *Harpalus*, taken by twenty-eight of the birds, *Anisodactylus* by eighteen, *Agonoderus* by fourteen, *Cratacanthus* by thirteen, *Pterostichus* by twelve, and *Evarthrus* by eleven; numbers which represent fairly well the relative abundance of individuals taking the entire season through. We note, however, a remarkable deficiency of the highly-colored genera, such as *Galerita*, *Brachynus*, *Lebia*, *Platynus*, *Chlænium*, etc., which are either absent or found but rarely in these birds' food. Evidently these more showy beetles are protected by some more effective means than obscurity of color."

PHYLLOXERA LAWS.—Belgium has lately entered the list of states which have adopted the rules of the International Convention of Berne relative to the prevention of *Phylloxera* ravages.

These rules prohibit the importation and transit, through Belgium, of vines, cuttings, etc., from infested districts, but allow their importation from non-infested districts subject to special authorization from the Minister of the Interior. Importation of garden produce, cereals, fruit and cut-flowers is not affected by these rules, but all other plants, shrubs and vegetables can only be admitted through the custom-houses and upon very stringent specified conditions.

FOSTERING THE STUDY OF ECONOMIC ENTOMOLOGY.—France does more for the promotion of economic entomology than any other country in Europe, as might be expected from a country whose main source of revenue, the grape vine, is so dangerously threatened by the Phylloxera, and which derives so much wealth from the cultivation of the silk-worm. The latest step is, as we learn, the donation of a plot of land by the city authorities of Paris for a school of "insectology" (to literally translate the bastard term that has of late come into use there) to be founded by the Société Centrale d'Agriculture et d'Insectologie. An experimental apiary, a silk nursery, and a mulberry plantation have already or are to be constructed in connection with this school; while a museum of useful and noxious insects, of insectivorous animals, etc., will help to illustrate the lectures to be held in the new school.—*C. V. R., in Rural New Yorker.*

VIVIPARITY IN A MOTH.—At a recent meeting of the London (Eng.) Entomological Society, a small moth was exhibited which had been received, from Dr. Fritz Müller, from Brazil. It possessed an exceptional interest from the fact that it was viviparous, having been seen by Dr. Müller to deposit living larvæ.

DAMAGE TO SILVER PLATE BY INSECTS.—Specimens of *Niptus hololeucus* have been received by Lord Walsingham from Scotland, said to have damaged silver plate, there being holes in the plate on which the insects were found. The corrosive property probably existed in the fæces.

THE HIBERNATION OF *ALETIA XYLINA*, SAY, IN THE UNITED STATES, A SETTLED FACT.¹—I have already shown in previous remarks before the association that there were various theories held by competent men—both entomologists and planters—as to the hibernation of this *Aletia* (the common cotton-worm of the South); some believing that it hibernated in the chrysalis state, some that it survived in the moth state, while still others contended that it did not hibernate at all in the United States. I have always contended that the moth survived within the limits of the United States, and in this paper the fact of its hibernation, principally under the shelter of rank wire-

¹ Abstract of a paper read by C. V. Riley before the American Association for the Adv. of Science, at the Montreal meeting.

grass, is established from observations and experiments made during the winter and spring of 1881-2. The moth has been taken at Archer, Fla., during every winter month until the early part of March, when it began to disappear, but not until eggs were found deposited. The first brood of worms was found of all sizes during the latter part of the same month on ratoon cotton, while chrysalides and fresh moths were obtained during the early part of April.

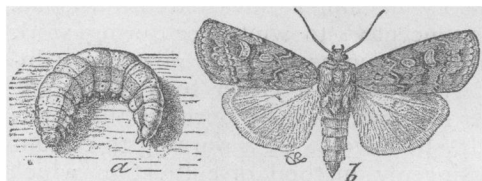
The fact thus established has this important bearing:

"Whereas upon the theory of annual invasion from some exotic country there was no incentive to winter or spring work looking to the destruction of the moths, there is now every incentive to such action as will destroy it either by attracting it during mild winter weather by sweets, or by burning the grass under which it shelters. It should also be a warning to cotton-growers to abandon the slovenly method of cultivation which leaves the old cotton-stalks standing either until the next crop is planted or long after that event; for many planters have the habit of planting the seed in a furrow between the old rows of stalks. The most careful recent researches all tend to confirm the belief that *Gossypium* is the only plant upon which the worm can feed in the South; so that in the light of the facts presented there is all the greater incentive to that mode of culture which will prevent the growth of ratoon cotton, since it is questionable whether the moth will survive long enough to perpetuate itself upon newly sown cotton except for the intervention of the ratoon cotton."

POSSIBLE FOOD-PLANTS OF THE COTTON-WORM.—In connection with the above abstract we are prompted to return once more to the subject of the food-plants of *Aletia*, by a very interesting note from Dr. J. S. Bailey in *Papilio* for December, 1882. He records the appearance of the moth at sugared trees on October 7th and 8th, 1882, near Karner, N. Y. On the first evening a crippled specimen was observed crawling up the sugared tree, while on the following evening one specimen appeared which evidently had just hatched from the chrysalis, and was shaking out its wings while ascending the tree. The other specimens of *Aletia* attracted by the bait were all of them bright and fresh. These facts observed by such a careful and trustworthy lepidopterist as Dr. Bailey, accord with the conclusions we arrived at in discussing the subject in the April (1882) number of this magazine (p. 327), and seem to us to conclusively prove that *Aletia* had passed at least one generation outside of the cotton belt, and that the larva must have fed upon some yet unknown plant different from *Gossypium*. It is to be regretted that Dr. Bailey failed to ascertain this food-plant of *Aletia* in the Northern States, because from the facts given by him, there can be little doubt that it was only a few steps away from the sugared tree. Traces of

the work of the larva or the empty chrysalis wrapped up in the leaves might perhaps even yet be found.—*C. V. Riley.*

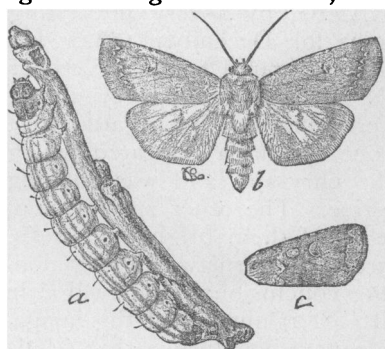
AGROTIS MESSORIA Harr. vs. *AGROTIS SCANDENS* Riley—In *Papilio* (Vol. 1, No. 8) Mr. A. R. Grote remarks that *Agrotis messoria* Harr. may be *Agrotis scandens* Riley. We have shown that the two bear no resemblance to each other, but that *A. messoria* is *A. cochranii* Riley, and that *A. repentis* G. & R., and *A. lycarum* Gr. are conceded synonyms (*Papilio*, Vol. 11, p. 41).



Agrotis messoria, a. larva; b. moth. (After Riley.)

In the new "Check-list of N. A. Moths," Mr. Grote properly makes *repentis* a synonym of *cochranii*, though he had previously given the former precedence. This last is, however, still retained as distinct from *messoria*, the types of which have confessedly never been examined by him. Yet, the identification of *messoria* is established by careful examination of Harris's types, both by myself and Mr. H. K. Morrison. Unfortunately, this instance of the rejection of the evidence of other entomologists when it conflicts with his own is not exceptional; it is rather characteristic of Mr. Grote's work.

We introduce a figure of the species. In our first Missouri Entomological Report, it was shown to greatly injure, in the larva state, the buds of fruit trees, and especially of apple, pear and grape-vines. We also reproduce from the same report, figures of *Agrotis scandens*, which in the larva state has some-



Agrotis scandens; a. larva; b. moth, normal form; c wing of dark var. (After Riley.)

what similar habits, in order to show the great difference between the two species, both in the larva and imago states. The colors in *messoria* are of a warm gray, with brown and smoky marks and shadings; in *scandens* they are a delicate pearly, pale, bluish-gray, with faint ferruginous-brown marks and a dusky spot on the reinform. The markings, as shown in the figures, are totally different in the two species, and no two species of the genus are more easily separated.

AN INTERNAL MITE IN FOWLS.—Professor Thomas Taylor, microscopist of the Department of Agriculture had occasion recently to dissect a sick chicken, and he found that all parts of

the lungs, the bronchia and the linings of the thorax and abdominal cavities were covered more or less thickly with a mite. An examination we were requested to make showed it to be in all respects identical with *Cytoleichus sarcoptoides* Mégnin. This parasite is known in Europe to inhabit the air passages of gallinaceous birds, giving the transparent and membranous linings of these passages the appearance of gold-beater's skin speckled with flour. It is likewise found in the bronchial tubes and their divisions, and even in the bones with which the air sacs communicate. Mégnin believes that while the mite may be extremely numerous, so as to cause mucous irritation and induce asphyxia and congestion by obstruction of the bronchia, and that birds may thus die, yet it is incapable of causing, as Gerlach and Zundel believe, enteritis or inflammation of the peritoneum.

PREVALENCE OF THE SCREW-WORM IN CENTRAL AMERICA.—Although not containing anything new the following portion of a letter from Mr. Jose C. Zeledon of San Jose, Costa Rica, recently addressed to Professor S. F. Baird, will be found of some interest: "I have mailed to you, to-day, a little box containing a good many specimens of *Lucilia* (perhaps two or three different species), which I hope will be of some service to Professor Riley in studying your species. Flies of this group are abundant throughout this country at all seasons of the year, but it is on the coast regions where they are particularly common, and there they constitute a very serious annoyance to cattle raisers, the larvæ becoming active in a few hours, owing to the high temperature of the lowlands."

The box contained several hundred flies, the large majority of which proved to be *Lucilia macellaria*, which is also the parent of the screw-worm in the United States.

DRIED LEAVES AS FOOD FOR LEPIDOPTEROUS LARVÆ.—Lepidopterists engaged in raising larvæ will be interested in a note by Mr. A. H. Mundt, of Fairbury, Ill., published in *Papilio* for January, 1883, giving his experience in feeding caterpillars with dried food. He gathers the leaves in summer, pressing them quite dry like botanical specimens, and before using them as food he soaks them one night in fresh water. This experiment was successfully tried with the larvæ of *Papilio cresphontes* and *Apatura clyton*. Mr. Mundt adds that the dried leaves must be kept in the dark in order to preserve the green color and the flavor. This experience with preserved food may prove equally useful for other species, and promises to be of great advantage in raising larvæ on food to be obtained from distant sections. We have never tried this method of curing leaves, though we have successfully used pressed fresh leaves, mailed and kept in tight tin boxes. In this way we have fed larvæ for weeks, in Washington, on food obtained in Florida. If "hay-making" should prove as successful

as Mr. Mundt's experience would indicate, we would recommend as a possible improvement in the curing and retention of the nutritive properties, the chopping of the leaves, which will permit of more rapid curing and more convenient packing.—C. V. R.

LEPIDOPTEROLOGICAL NOTES.—The activity lately displayed by our lepidopterists in making known through the columns of our entomological periodicals the earlier states of Lepidoptera, is very gratifying. Authors should, however, avoid the duplication of descriptions of larvæ and especially of such species as have been fully described in publications that are of easy access. There can be nothing gained by such duplication, especially where the subsequent description is less accurate than the original one.—Mrs. C. H. Fernald has published in *Papilio* for January, 1883, a list of the Noctuidæ taken in Orono, Me., and vicinity. Such lists, when, as in this case, they are sufficiently complete to indicate the character of the fauna, and reliable as to the determination, are very useful.

OBITUARY.—The entomologists of this country, as well as of Europe, will regret to learn of the death of Mr. G. W. Belfrage, on December 7, 1882, at Clifton, Bosque county, Tex. If the insect fauna of Texas is, at the present time, better known than that of most of the other Western States of this continent, it is largely due to the skill and industry of Mr. Belfrage and the late Mr. Jacob Boll, who were foremost among the few really careful and conscientious collectors in the country. The number of new and interesting species discovered by Mr. Belfrage is really astonishing, considering that they were collected in a very limited area of the State, and several of his discoveries were named after him by our most prominent entomologists. The care and neatness he exhibited in preserving and preparing his specimens, as well as the honesty with which he filled the orders of his numerous correspondents, deservedly procured him a reputation as a collector which extended far beyond the limits of this country.

Professor F. W. Mæklin died January 8th of this year at Helsingfors, Finland, at the age of sixty-one years. He was known to American coleopterists by his papers on *Strongylium* and *Statira*, and by his descriptions of a large number of Coleoptera (mostly Staphylinidæ) from the extreme north-western portions of our country. One of his earlier and little known papers, a dissertation on representative (*vikarierande*) forms among Northern Coleoptera (published in Swedish language, Helsingfors, 1855) is quite interesting to American coleopterists, and was translated into German by F. von Sacken in the *Stettiner Entomologische Zeitung* for 1857.